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ALLISON JOHNSON, P.A.
LAKE CALHOUN EXECUTIVE CENTER
3033 EXCELSIOR BLVD., SUITE 467
MINNEAPOLIS, MN 55416

EXAMINER	
ROSENBERGER, FREDERICK F	
ART UNIT	**PAPER NUMBER**
2884	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/774,910	SMITH, PATRICK G.	
	Examiner	Art Unit	
	Frederick F. Rosenberger	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-20 and 22-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *20* is/are allowed.

6)☒ Claim(s) *1,3-14,16,19 and 22-31* is/are rejected.

7)☒ Claim(s) *15,17 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's reply, filed 6 January 2006, has been received and entered. Accordingly, changes have been made to the specification and the drawings. Claims 1, 3-12, and 20 have been amended. Claims 2 and 21 have been cancelled. No new claims have been added. Thus, claims 1, 3-20, and 22-31 are currently pending in this application.

2. The drawings were received on 6 January 2006. These drawings are acceptable.

3. Applicant's amendment of the specification and the drawings has successfully overcome the objections to the specification and the drawings, as detailed in paragraphs 2-7 of the previous Office action.

4. Applicant's amendment of the claims has successfully overcome the objections to claims 2-12, as detailed in paragraph 8 of the previous Office action.

5. The indicated allowability of claims 2-8 and 21-31 is withdrawn in view of the newly discovered reference(s) to Tacke et al. (US Patent # 6,555,820). Rejections based on the newly cited reference(s) follow.

Claim Objections

6. Claim 16 is objected to because of the following informalities: In claim 16, line 1, "wherein a filter interposed" should be --wherein a filter is interposed--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 28-31are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: in the step of analyzing in claim 28, the signals should be the summed signals from the analytical detectors. As written, it implies that the signals analyzed are not the summed signals, which is in disagreement with applicant's specification. Claims 29-31 are rejected as being dependent upon claim 28.

9. Claim 31 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: the step of summing signals generated by said analytical detectors further comprising summing the signals from at least two analytical detectors to determine the concentration of a first gas of interest and

summing the signals from at least two additional analytical detectors to determine the concentration of a second gas of interest.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. Claims 22, 24, 26, and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Tacke et al. (US Patent # 6,555,820).

It is noted that US Patent # 6,555,820 is a national stage filing of International Patent Application PCT/DE99/02627 and corresponding non-English PCT publication document # WO 2000/11452, published 2 March 2000, which would qualify as prior art under 35 U.S.C. 102(b).

With regards to claim 22, Tacke et al. disclose a method of detecting a gas using a gas detector, the gas detector comprising:

A source of IR radiation **1** (Figure 1);

At least two analytical detectors, in the form of four detector elements **7** in a row **6** (Figure 1) positioned to receive radiation from the source **1**, each analytical detector providing an output signal indicative of a test gas (abstract);

And, a sample chamber **3** for receiving a gaseous sample (column 5, lines 37-42), wherein the optical path from the source **1** to the detectors **7** passes through the sample chamber **3** (Figure 1).

The method comprising the steps of:

Transmitting IR radiation from said source **1** through the sample in the sample chamber **3**;

Detecting IR radiation of a predetermined wavelength in the mid-IR region at each analytical detector **7**;

Sending as signal from the analytical detectors **7** to a processor;

And summing the signals from the analytical detector (column 7, lines 19-38).

With regards to claim 24 and 26, Tacke et al. disclose that the summing step occurs in the processor after the signals are sent from the analytical detectors to the processor (column 7, lines 34-38).

With regards to claim 27, Tacke et al. disclose that the radiation incident on the detectors is unreflected from surfaces interposed between the analytical detectors and the source (Figure 1). Instead, the radiation is diffracted to achieve spectral distribution of the radiation from the gas chamber across the detector row **6**.

Claim Rejections - 35 USC § 103

12. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

13. Claims 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tacke et al., as applied to claim 22 above.

With regards to claims 23 and 25, Tacke et al. disclose all the limitations of parent claim 22, as discussed above. However, Tacke et al. is silent with regards to the summing occurring in the analytical detectors. It would have been obvious to one having ordinary skill in the art at the time the invention was made to integrate the means for summing and the analytical detectors, thus allowing for the summing to occur in the analytical detectors prior to sending to the processor, since it has been held that making separate structures into a single piece without producing any new and unexpected results involves only routine skill in the art. In re Larson, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965).

14. Claims 1, 3-8, 10-14, 19, and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tacke et al., and further in view of McVey (US Patent # 6,875,399).

With regards to claim 1, Tacke et al. disclose a gas detector comprising:

A source of IR radiation **1** (Figure 1);

At least two analytical detectors, in the form of four detector elements **7** in a row **6** (Figure 1) positioned to receive radiation from the source **1**, each analytical detector providing an output signal indicative of a test gas (abstract);

A means for summing the output signals from the detectors **7**, in the form of summer **10** (Figure 1; column 6, lines 25-30);

And, a sample chamber **3** for receiving a gaseous sample (column 5, lines 37-42), wherein the optical path from the source **1** to the detectors **7** passes through the sample chamber **3** (Figure 1).

Tacke et al. do not specifically mention using at least one reference detector adapted to provide an output signal independent of the first gas of interest.

With regards to applicant's use of adapted to, claim scope is not limited by claim language that suggests or makes optional but does not require steps to be performed, or by claim language that does not limit a claim to a particular structure. However, examples of claim language, although not exhaustive, that may raise a question as to the limiting effect of the language in a claim are:

(A) " adapted to " or "adapted for " clauses;

(B) " wherein " clauses; and

(C) " whereby " clauses.

The determination of whether each of these clauses is a limitation in a claim depends on the specific facts of the case. See MPEP 2111.04. In the present case, "adapted to" has not held to be limiting on the structure of the detectors by detecting a specific wavelength range wherein the signal would be independent of the first gas of interest.

However, the use of a reference detector is well known within the gas detection art. For example, McVey teaches an infrared gas sensor for detecting a particular gas in a multicomponent gas. McVey specifically teaches using a reference detector adapted to provide a signal independent of a first and second gas of interest by

appropriate choice of a filter (column 12, lines 6-16). McVey further teaches that such reference detectors enable the signals of the analytical detectors to be normalized to account for variations in light source fluctuations, which would otherwise adversely affect signal integrity (column 12, lines 17-21).

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to provide a reference detector to the system of Tacke et al. to account for variations in light source intensity so as to improve the signal integrity of the analytical detectors, as taught by McVey.

With regards to claim 3, Tacke et al. teach that the summer is separate from the analytical detectors. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to integrate the means for summing and the analytical detectors, since it has been held that making separate structures into a single piece without producing any new and unexpected results involves only routine skill in the art. In re Larson, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965).

With regards to claim 4, Tacke et al. discloses a summer, which is known in the art as an amplifier-based circuit for adding signals together.

With regards to claims 5-7, Tacke et al. disclose a summer for adding the signals from the respective analytical detectors together. Tacke et al. do not specifically address a summing node (analog or digital). However, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to use a summing node for the means for summing, since the examiner takes Official Notice of the equivalence of summing node, microprocessor, and summing amplifier for use in

detector art and the selection of any of these known equivalents to sum the signals from the detectors would be within the level of ordinary skill in the art (see, for example, US Patents 3,898,462 and 4,523,509 for summing amplifiers; US Patent 5,898,183 for summing nodes; US Patent # 4,278,538 for summing in a microprocessor).

With regards to claims 8 and 19, Tacke et al. disclose that the summer and other associated circuitry can be replaced by an appropriately configured CPU, so as to perform the necessary amplification and summing tasks (column 7, lines 19-38). It is well known that a microprocessor is a device that integrates the functions of the central processing unit (CPU) of a computer onto one semiconductor chip or integrated circuit (IC). Thus, a microprocessor would have a size and power consumption advantage over the use of entire CPU. Further, a microprocessor would allow integration with other semiconductor components, such as the summer and signal amplifiers. Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to provide a microprocessor in place of the CPU to take advantage of the well-known size, power consumption, and integration advantages of a microprocessor over a CPU.

With regards to claims 10-12, Tacke et al. discloses a single IR source for generating mid-IR light, but not the type of source. However, heated filaments, black body radiators, LEDs, and incandescent lamps are all well-known equivalent sources for IR illumination (for example, Mottier et al. (US Patent # 6,545,278) discloses an incandescent source). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a heated filament, a blackbody radiator, an

LED, or an incandescent lamp for the IR source, since the examiner takes Official Notice of the equivalence of the IR sources for their use in IR illumination and the selection of any of these known equivalents as an IR source for illumination of a gas of interest would be within the level of ordinary skill in the art.

With regards to claims 13 and 14, Tacke et al. disclose at least four analytical detectors **7** in row **6** (Figure 1).

With regards to claims 28, Tacke et al. disclose a method of analyzing a gas sample, the method comprising the steps of:

Providing a gas sample in a sample chamber **3**, of a gas detector (Figure 1), the gas detector comprising:

A source of IR radiation **1** (Figure 1);

At least two analytical detectors, in the form of four detector elements **7** in a row **6** (Figure 1) positioned to receive radiation from the source **1**, each analytical detector providing an output signal indicative of a test gas (abstract);

And, a sample chamber **3** for receiving a gaseous sample (column 5, lines 37-42), wherein the optical path from the source **1** to the detectors **7** passes through the sample chamber **3** (Figure 1).

Radiating the gas sample with radiation **2** from source **3**;

Detecting the radiation at the analytical detectors **7**;

Generating signals corresponding to the detected radiation (column 6, lines 7-20);

Summing signals from the analytical detectors in summer **10** (Figure 1);

Analyzing the signals generated by the detector to determine the gross calorific value of the gas (column 6, lines 25-33).

Tacke et al. do not specifically disclose the nature of the sample chamber, i.e. that the sample gas can be passed through the sample chamber. However, Tacke et al. do disclose using the gas detector for determining the gross-calorific value of natural gas in pipelines (column 2, lines 24-35). Further, the use of pass through cells in gas detection systems is well known. For example, McVey discloses an IR gas detector (Figure 2) wherein gas from a pipeline is allowed to pass through the gas cell via openings **106**, thus enabling real-time monitoring of gases within the system. Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to pass the gas sample through a sample chamber of the detector so as to enable real time monitoring of the gas within a pipeline, as taught by McVey.

With regards to claim 29, Tacke et al. disclose determining the gross calorific value of the sample gas (abstract). This provides a measure of the presence or absence of the gas of interest, as a zero calorific value would indicate that no natural gas was present.

With regards to claim 30, Tacke et al. disclose that the gross calorific value for a gas is related to its concentration within the sample (column 3, lines 7-12).

15. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tacke et al. and McVey, as applied to claim 1 above, and further in view of Busignies et al. (US Patent # 2,866,900) and Wong (US Patent # 5,650,624).

Tacke et al. and McVey disclose all the limitations of parent claim 1, as discussed above. However, the combination of Tacke et al. and McVey is silent with regards to an interference filter positioned to filter at least one of the analytical detectors. Instead, Tacke et al. uses prism **4** to achieve spectral distribution of the measured light across the detector row **6**.

Busignies et al. teach that eliminating dispersive components, such as prisms or gratings, in favor of filtering elements greatly simplifies a gas detection apparatus. Further by electing for filtering elements in front of the detector rather than a moving prism, as disclosed by Tacke et al., the mechanical construction of the device can be simplified (column 7, lines 11-18). Further, by using filtering elements as opposed to a prism or grating, the length of the layout necessary to cover a particular spectral range can be reduced, since it is well known that the width of the dispersed spectrum increases with distance from the dispersing element.

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to use filtering elements instead of a prism dispersing to achieve a detector array with a particular spectral response indicative of the first gas, since the use of filtering elements would enable a simplified and more compact construction for the gas detector, as taught by Busignies et al.

The combination of Tacke et al., McVey, and Busignies et al. is further silent with regards to the use of interference filters. However, interference filters are well known in the art. For example, Wong teaches the use of interference filters F_1 with a detector D_1 of a gas detector for selecting the appropriate wavelength range indicative of a gas of interest (column 6, lines 10-20).

Thus, it would have been obvious for person having ordinary skill in the art at the time the invention was made to use interference filters for the filtering elements since their use in the art was well known for selecting an appropriate wavelength range in the detection of a gas of interest in a gas detector, as taught by Wong.

16. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tacke et al. and McVey, as applied to claim 1 above, and further in view of Busignies et al. (US Patent # 2,866,900).

Tacke et al. and McVey disclose all the limitations of parent claim 1, as discussed above. However, the combination of Tacke et al. and McVey is silent with regards to an interference filter positioned to filter at least one of the analytical detectors. Instead, Tacke et al. uses prism **4** to achieve spectral distribution of the measured light across the detector row **6**. Each detector receives a portion of the spectral band between 3.2 to 3.6μm or 1.6 to 1.8μm, which is indicative of the natural gas.

Busignies et al. teach that eliminating dispersive components, such as prisms or gratings, in favor of filtering elements greatly simplifies a gas detection apparatus.

Further by electing for filtering elements in front of the detector rather than a moving prism, as disclosed by Tacke et al., the mechanical construction of the device can be simplified (column 7, lines 11-18). Further, by using filtering elements as opposed to a prism or grating, the length of the layout necessary to cover a particular spectral range can be reduced, since it is well known that the width of the dispersed spectrum increases with distance from the dispersing element.

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to use filtering elements instead of a prism dispersing to achieve a detector array with a particular spectral response indicative of the first gas, since the use of filtering elements would enable a simplified and more compact construction for the gas detector, as taught by Busignies et al.

Allowable Subject Matter

17. Claim 20 is allowed.

18. Claim 15, 17, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

19. Claim 31 would be allowable if rewritten or amended to overcome the 35 U.S.C. 112 rejection as set forth in this Office action.

20. The following is a statement of reasons for the indication of allowable subject matter:

Claim 15 is directed to a gas detector wherein at least two of the analytical detectors are adapted to provide an output signal indicative of a first gas of interest and at least two additional analytical detectors provide an output signal indicative of a second gas of interest different from the first. Tacke et al. discusses a first set of analytical detectors for analyzing natural gas, but doesn't discuss a separate second set of analytical detectors for analyzing a second gas of interest. Further, there is no reasonable motivation to provide Tacke et al. with a second set of analytical detectors. As such, claim 15 and associated dependent claims 17 and 18 would be allowable over the prior art.

Claim 20 is directed to a gas detector comprising a least two IR detectors, which are adapted to detect radiation of a first wavelength and provide an output signal corresponding to the presence of a gas of interest, and a means for summing said output signals. Tacke et al. provides a means for summing analytical detector output signals, but has different detectors responsive to different wavelengths in the mid-IR range to provide a signal indicative of the gross calorific value of the sample gas. There is no reasonable suggestion or motivation in the prior art for providing Tacke et al. with multiple detectors for detecting the same wavelength since Tacke et al. aim to measure the gross calorific content of the sample gas through absorption of the C-H bonds of the test gas in the range from 3.2μm to 3.6μm. Other gas detectors in the prior art suggest using two or more detectors detecting the same wavelength indicative of a gas of

interest. However, there is no reasonable suggestion or motivation in the prior art to include a means for summing with these detectors. As such, applicant's disclosure provides a novel and nonobvious improvement over the prior art. Accordingly, claim 20 would be allowable.

Claim 31 recites a method for analyzing a gas sample wherein the step of analyzing comprises determining the concentration of a first gas of interest based on the summation of signals from at least two analytical detectors and the concentration of a second gas of interest based on the summing of signals from at least two additional analytical detectors. Tacke et al. only deal with a single set of analytical detectors for determining the gross calorific content of natural gas. There is no reasonable motivation to provide Tacke et al. with a second set of analytical detectors for detecting a second gas of interest. As such, claim 31 would be allowable over the prior art.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Goldenberg et al. (US Patent # 6,061,141) disclose a gas sensor using multiple analytical detectors **54**, **58** (Figure 5) with a single reference detector **56** to sense the presence of predetermined vapor. The signals from the analytical detectors are compared to determine the occurrence of spectral disturbances not due to the detection of vapor (column 17, lines 39-45).

Teder (US Patent # 5,898,183) teaches the use of a summing node in the combination of signals from detectors (column 15, lines 16-19).

Lawrence et al. (US Patent # 4,278,538) teach summing detector signals in a microprocessor (column 14, lines 41-48).

Keller-Steinbach (US Patent # 4,523,095) teaches using a summing amplifier to combine signals from different detectors (claim 6).

Lessure et al. (US Patent # 5,886,348) disclose a gas detector with two analytical detectors and a reference detector, the first analytical detector providing a signal indicative of a target gas, the second analytical detector providing a signal indicative of a target gas + CO_2, and the reference detector providing a signal indicative of water vapor.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Frederick F. Rosenberger whose telephone number is 571-272-6107. The examiner can normally be reached on Monday-Friday 8:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Frederick F. Rosenberger
Patent Examiner
GAU 2884

DAVID PORTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800